Original Article

HEALTH SCIENCES
MEDICINE

DOI: 10.32322/jhsm.1106031
J Health Sci Med 2022; 5(5): 1207-1214

Comparison of tolterodine, trospium chloride, solifenacin treatments and its side effects on patients with pure urinary and mixed incontinence

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Cite this article as: Özgürlük İ, Ünlübilgin E, Dölen İ. Comparison of tolterodine, trospium chloride, solifenacin treatments and its side effects on patients with pure urinary and mixed incontinence. J Health Sci Med 2022; 5(5): 1207-1214.

ABSTRACT

Objective: Urinary incontinence is defined as urinary incontinence that is a social or hygienic problem and can be objectively demonstrated. It is aimed to compare tolterodine, trospium chloride and solifenacin treatments, and its side effects on patients who have complaints of pure urinary and mixed incontinence.

Material and Method: Totally 98 patients, who applied to Ankara Etlik Zubeyde Hanım Gynecology Training and Research Hospital, Urogynecology Outpatient Clinic between November 2009 and October 2010 with compliants of urinary incontinence and met the criteria to participate in the research, have been included in this study.

Results: A significant improvement in each three of the drug group at third and six months was determined. Solifenacin is generally more effective than the other two treatments. When total values of UDI-6 (Urinary Distress Inventory) survey is analysed, it is seen that each of three antimuscarinic drug group ensured improvement on symptoms at the end of the third month as not to be different from the improvement at the six month. Each three antimuscarinic drug group has a significant therapeutic effect on the IIQ-7 (Incontinence Impact Questionnaire) survey which questions the life quality. Whereas complaints of constipation was seen more at patients that use tolterodine and trospium chloride, there was not a significant difference despite a slight increase in the solifenacin group ($p>0.05$). It is determined that solifenacin caused desert mouth less than the other two drug groups

Conclusion: Tolterodine, trospium chloride and solifenacin as anticholinergic drugs meaningfully reduced the activity of bladder and increased the quality of life. Drug therapy provided an effective and efficient improvement on incontinence.

Keywords: Pure urinary incontinence, tolterodine, trospium chloride, solifenacin, urogenital distress inventory, incontinence impact questionnaire

INTRODUCTION

Urinary incontinence is defined as urinary incontinence that is a social or hygienic problem and can be objectively demonstrated by International Continence Society (ICS) (1). Urinary incontinence impairs the quality of life of people, restricts the social life of the person and causes psychological problems. It is more common in females than males and can affect females at all age groups. This situation is caused by lower urinary tract pathologies, which affects 10-70% of women (2). Previous studies have shown that, especially overactive bladder symptoms increase with age (3,4). Urinary incontinence is a symptom, not a diagnosis. Although its frequency increases with age, it is not a normal part of aging and should not be considered as an insignificant complaint (5).

The differential diagnosis of urinary incontinence etiology is quite broad. Because of the different pathophysiologies of incontinence, treatment should be etiologically oriented, most effective and most accurate. Today, there are a wide range of treatment options ranging from drug therapy to behavioral therapies and, if necessary, surgical interventions. With a better understanding of the pathophysiology of incontinence, these treatment options will be longer-lasting and more

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Received: 19.04.2022 **Accepted:** 03.07.2022

successful in the coming years (6,7). The effectiveness of the treatment can be understood by questioning whether the changes after the treatment have a positive effect on the quality of life.

Patients benefit from anticholinergic agents, but they discontinue treatment in the long term. The most important reason for this is the long duration of treatment and possible side effects of anticholinergic agents (8-10). Today, anticholinergic agents that patients can tolerate better are also used. The M3 muscarinic receptor is specifically found in the detrusor muscle. However, anticholinergic drugs block not only the M3 receptor, but also the M1 receptor (brain, salivary gland) and M2 receptor (heart, intestine, etc.) found in other organs. This causes the drugs to show some side effects. Depending on the detrusor muscarinic receptor selectivity of the drug, these side effects vary in severity and type, but depending on the dose, blurred vision, constipation, dry mouth, anxiety, confusion, dizziness, insomnia, nausea and urticaria can be observed. These side effects affect the patient's use of the drug and satisfaction (11,12). For this reason, more selective M3 receptor blockers are being developed.

In 2004, the FDA (Food and Drug Administration) approved the use of darifenacin, solifenacin and trospium chloride in the treatment of overactive bladder (13). Although there are studies in which drug efficacy is compared with placebo, it is seen that some of them are compared within themselves (14-16). Quality of life scoring criteria were mostly established by placebo studies (17-19).

In this study, tolterodine, trospium chloride and solifenacin from the group of anticholinergic agents were compared with each other in terms of efficacy and potency, based on the scoring of the voiding diary, quality of life and drug side effects. It was aimed to evaluate the changes in the voiding diary, UDI-6 (Urinary Distress Inventory) questionnaire, IIQ-7 (Incontinence Impact Questionnaire) questionnaire, and anticholinergic drug side effects in overactive bladder and mixed type cases.

MATERIAL AND METHOD

The study was conducted with the permission of the Noninvasive Clinical Education Planning Board of 3rd step Training and Research Hospital in Ankara (Date: 25.11.2019, Decision No: 2009/119). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

A total of 98 patients who applied to the Urogynecology outpatient clinic of 3rd step Training and Research Hospital between November 2009 and October 2010 with the complaint of urinary incontinence and met the inclusion criteria of the study were included. Detailed informed consent was taken from all the patients. In this prospectively planned and conducted study, women who applied to the 3rd step Training and Research Hospital Urogynecology outpatient clinic with the complaint of urinary incontinence were evaluated at the first stage. Anamnesis of the cases was taken, physical examinations were performed and laboratory tests (full urinalysis, urine culture and fasting blood glucose) were requested.

In the anamnesis, in which condition and how urinary incontinence occurred was questioned. Whether there is involuntary leakage of urine during physical activity, movement (eg. playing sports, running, climbing stairs, sitting up, lifting heavy), sneezing, coughing or laughing. It was questioned whether there was a sudden urge to urinate due to sudden pain, pressure, pressure or discomfort and whether there was urinary incontinence due to this. Involuntary leakage of urine during physical activity, movement, sneezing, coughing or laughing "stress urinary incontinence (SUI)", a sudden and severe urination feeling that cannot be prevented and delayed with a sense of urgency caused by sudden pain, pressure, pressure or discomfort, and related incontinence was defined as "urge urinary continence (UUI)" and urinary incontinence in both ways was defined as "mixed urinary incontinence (MUI)".

Age, menopausal status, parity and mode of delivery, weight, height, overt diabetes, hypertension, urinary stone and chronic kidney disease history or history of surgery, neurological disease, antidiabetic, antihypertensive, diuretic, antidepressant or antipsychotic drug use In his anamnesis, it was questioned whether he had received medical treatment for incontinence, whether he had a previous operation involving the pelvic floor, whether due to incontinence or not.

External genital organs and urethral orifice were observed in the local genitourinary system examination of the cases while they were in the lithotomy position. Vaginal walls and cervix were observed with speculum examination. The presence of urinary incontinence was determined by applying a stress test with Valsalva maneuvers while the patient was in a semi-constricted state. In addition, pelvic relaxation status, which contributes to the development of urinary incontinence and may affect the treatment method, was evaluated with the Baden-Walker Halfway staging system. With Valsalva maneuver, uterine cervix descent, rectocele, cystocele, urethrocele, bladder neck mobility were noted. The Q-Tip Test evaluated the anatomical support of the paraurethral tissues, the degree of mobility of the bladder neck and proximal urethra.

In the design phase of the study, it was planned to perform urodynamic examination in order to objectively demonstrate the efficacy of the diagnosis in the initial evaluation of the cases and then in the 3rd and 6th months of the medical treatment. However, during the two years for which the data of our study were collected, urodynamic examination could not be performed on the patients due to technical inadequacy.

All patients were asked to keep a two-day voiding diary in which the amount of fluid consumed, the number of urination, the total amount of urine, the number of urgency to urinate, and the amount of incontinence were questioned. In addition, the Urogenital Distress Inventory-6 (UDI-6) questionnaire was applied to the patients, in which urinary incontinence complaints were questioned over six questions validated for the Turkish society and the Incontinence Impact Questionnaire-7 (IIQ-7) questionnaire form with seven questions evaluating the social life and quality of life of the patients. The first two questions in the UDI-6 form questioned the patients irritative symptoms, the next two questions asked their stress symptoms and the last two questions were asked about obstructive and voiding symptoms, and the questions were scored as none (0), mild (1), moderate (2) or a lot (3). In the IIQ-7 questionnaire, the physical activities of the patients were questioned with the first two questions, their travel quality with the next two questions, their social relations with the next question and their emotional health status with the last two questions.

The cases with pure SUI as a result of the examinations and tests were not included in the study group.

In addition, those whose blood glucose level is not regulated despite using antidiabetic drugs, those who use antihypertensive, diuretic, antidepressant or antipsychotics, those with 3rd and 4th degree pelvic organ prolapse, those who have received medical treatment for overactive bladder before, whether for incontinence or those who had undergone surgery involving the pelvic floor, those with urolithiasis and chronic kidney disease or a history of surgery and those with a history of neurological disease were also excluded from the study.

Patients who were found to have pure UUI or MUI after the initial diagnosis were given detailed information about the need to start anticholinergic drug therapy which was developed as an M3 muscarinic receptor blocker to reduce or eliminate urinary incontinence complaints.

Ophthalmology consultation was requested from the patients who agreed to participate in the study before starting the treatment to investigate the presence of narrow-angle glaucoma, which is a contraindicated condition for the use of anticholinergic drugs.

Complete urinalysis was repeated after the patients with urinary tract infection detected in complete urinalysis and urine culture were treated appropriately. Cases whose urinary tract infections were treated but still had complaints of UUI or MUI and cases whose blood glucose levels were regulated by the use of antidiabetic drugs were included in the study.

Ninety-eight cases met the inclusion criteria and agreed to participate in the study. Anticholinergic agents, which are M3 receptor blockers, were started as tolterodine SR 4 mg tablet (once daily), trospium chloride tablet (30 mg in the morning, 15 mg in the evening) and solifenacin 5 mg tablet (once daily) according to the order of admission to the hospital. It is recommended to use them for at least 6 months.

Treatment efficacy was observed with the UDI-6 and voiding diary form applied to the patients in the third and sixth months of the treatment and the changes in the effect of incontinence on life with the IIQ-7 form. Investigation of side effects after treatment with anticholinergic drugs was done with an anticholinergic side effect evaluation form. Blurred vision, constipation, dry mouth, anxiety (feeling nervous, scared or irritable), dizziness, insomnia (insomnia, inability to sleep or waking up earlier than usual), nausea-vomiting, urticaria (lesions that may be itchy on the skin) / allergic reaction symptom and its findings were questioned.

A total of five patients, one in the trospium chloride patient group and two each in the tolterodine and solifenacin patient group were excluded from the study because they dropped out of follow-up or did not comply with their drug use. The study was completed with the remaining 93 patients.

Statistical analysis of the data obtained at the end of the sixth month was performed using the SPSS 15.00 program. One Way Anova, Paired-Samples T Test, Mann Whitney. It was analyzed using U, Chi-Square, Wilcoxan tests. A p value of <0.05 was considered significant.

RESULTS

A total of 93 patients whose results were analyzed in the study were found to be equal in 3 treatment groups (trospium group n=31, tolterodine group n=31, solifenacin group n=31). The mean age, number of births and body mass index of the women in the 3 groups were similar ($p>0.05$) (**Table 1**).

Table 1. Demographic data of the cases

	Treatment group	Average±SD	Min–Max	p
Age	Trospiyum (n=31)	51.9±12.3	32–86	0.416
	Tolterodin (n=31)	55.0±11.9	31–80	
	Solifenasin (n=31)	55.7±11.4	40–80	
Parity	Trospiyum (n=31)	3.74±2.6	1–13	0.317
	Tolterodin (n=31)	4.74±2.4	0–10	
	Solifenasin (n=31)	4.42±2.9	0–13	
Body mass index (kg/m^2)	Trospiyum (n=31)	29.8±5.1	21.5–47.1	0.402
	Tolterodin (n=31)	31.5±5.2	21.9–44.4	
	Solifenasin (n=31)	30.1±5.3	22.7–39.5	

The mean number of urination per day, the number of urgency to urinate and the amount of urinary incontinence, which are the voiding diary parameters, were similar in all three drug groups before the start of treatment (p>0.05). When the efficacy of treatment was evaluated over time, a significant improvement was found in all parameters of the voiding diary in the third and sixth months compared to the initial values (p<0.05) (**Table 2**).

However, it was determined that the decrease in the number of urination was the highest in the solifenacin group and this decrease was significantly higher than the other groups (p<0.05).

While there was a statistically significant decrease in the number of urgent urination in all groups compared to the pre-treatment period in the 6-month period, it was observed that this decrease was the least in the tolterodine group. In cases using trospium and solifenacin, a similar decrease was found in the rate of urgency to urinate (**Table 2**).

The mean decrease in urinary incontinence was higher in the tolterodine and solifenacin groups than in those using trospium (**Table 2).**

Table 2. Comparison of voiding diary parameters by treatment groups

		Tolterodin	Trospiyum	Solifenasin	p
Number of urination (n)	Beginning	7.4±2.2	7.7±3.8	6.5±0.7	>0.05
	3 months	5.6±0.9	7.0±3.3	4.6±0.6	<0.05
	6 months	5.2±1.3	5.6±2.7	4.4±0.5	<0.05
p		<0.05	<0.05	<0.05	
Number of urgency to urinate (n)	Beginning	4.7±1.4	4.0±1.8	4.2±2.5	>0.05
	3 months	3.4±0.2	2.2±1.3	2.0±1.4	<0.05
	6 months	2.3±0.0	1.3±0.9	1.4±1.1	<0.05
p		<0.05	<0.05	<0.05	
Amount of incontinence (ml)	Beginning	197±43	207±95	188±61	>0.05
	3 months	118±14	143±79	117±49	<0.05
	6 months	62±33	87±55	65±35	<0.05
p		<0.05	<0.05	<0.05	

When the total scores in the UDI-6 questionnaire were examined, the initial UDI-6 scores of all three antimuscarinic drug groups were similar (p>0.05). However, there was a significant improvement in symptoms at the end of the third month in all three groups during the treatment process (p<0.05). Although this improvement continued significantly at the 6th month, the changes in the UDI-6 scores at the 3rd and 6th months were similar in all 3 drug groups (p>0.05) (**Table 3, Table 4**).

The IIQ-7 (Incontinence Effect Questionnaire-7) groups were similar to each other before treatment (p>0.05). In the IIQ-7 evaluation performed at the 3rd and 6th months of the treatment, it was observed that there was a significant decrease in IIQ-7 scores in all drug groups compared to the pre-treatment period, thus a significant improvement in the effect of incontinence (p<0.05). The IIQ-7 scores at 3 and 6 months were similar in all three groups (p>0.05) **(Table 5, Table 6**).

When the side effects of anticholinergic drugs used in the treatment (blurred vision, constipation, dry mouth, anxiety, dizziness, insomnia, nausea, urticaria) were examined, it was observed that complaints and symptoms were similar in all groups at the beginning (p>0.05).

While the rates of blurred vision at the 3rd and 6th months of the treatment did not differ from the initial rates in the trospium and solifenacin groups (p>0.05), it was found to increase significantly in the tolterodine group at the 6th month (p<0.05).

Constipation increased significantly in the groups using tolterodine and trospium both at the 3rd and 6th months compared to the baseline (p<0.05). While the constipation rates in the group using trospium were similar at the 3rd and 6th months (p>0.05), the constipation rate at the 6th month was found to be significantly higher in the group using tolterodine compared to the 3rd month (p<0.05). In the group using solifenacin, the rate of development of constipation did not differ significantly from the baseline (p>0.05).

Table 3. Urinary Distress Inventory, Short Form (UDI-6).

For each question, circle the number that best describes this problem for you over the past month. Do you experience and, if so, how much are you bothered by:

	Not at All	A Little Bit	Moderately	Greatly
Frequent urination?	0	1	2	3
Urine leakage related to urgency?	0	1	2	3
Urine leakage related to physical activity? (walking, running, laughing, sneezing, coughing)	0	1	2	3
Small amounts of urine leakage? (drops)	0	1	2	3
Difficulty emptying your bladder or difficulty urinating?	0	I	2	3
Pain or discomfort in your lower abdominal, pelvic, or genital area?	0	I	2	3

Table 4. Comparison of UDI-6 scores during treatment according to drug groups

Drug	Beginning	3 months	6 months	p
Trospiyum	1.06±0.28	0.48±0.19	0.54±0.23	<0.05
p		>0.05		
Tolterodin	1.10±0.23	0.54±0.23	0.65±0.34	<0.05
p		>0.05		
Solifenasin	1.18±0.37	0.47±0.37	0.55±0.41	<0.05
p		>0.05		

Table 5. Incontinence Impact Questionnaire, Short Form (I1Q-7).

Some people find that accidental urine loss may affect their activities, relationships, and feelings. For each question, circle the response that best describes how much your activities, relationships, and feelings arc being affected by urine leakage over the past month. Has urine leakage (incontinence) affected your:

	Not at All	Slightly	Moderately	Greatly
Ability to do household chores (cooking. housecleaning, laundry)?	0	1	2	3
Physical recreation such as walking, swimming, or other exercise?	0	1	2	3
Entertaining activities (movies. concerts, etc.)?	0	1	2	3
Ability to travel by car or bus more than 30 minutes from home?	0	1	2	3
Participation in social activities outside your home?	0	1	2	3
Emotional health (nervousness, depression, etc.)?	0	1	2	3
Feeling frustrated?	0	1	2	3

Table 6. Comparison of IIQ-7 values during the treatment process according to drug groups

Drug	Beginning	3 months	6 months	p
Trospiyum	1.65±0.79	0.44±0.40	0.36±0.42	<0.05
p		(p>0.05)		
Tolterodin	1.71±0.69	0.97±0.49	0.88±0.46	<0.05
p		(p>0.05)		
Solifenasin	1.70±0.84	0.56±0.52	0.49±0.49	<0.05
p		(p>0.05)		

Dry mouth increased strongly at the end of the 3rd and 6th months of treatment in all three drug groups (p<0.05). In the tolterodine group, this increase was higher than in the other two groups. Although statistically significant, the least increase was observed in the solifenacin group. It was determined that the rate and severity of dry mouth did not change between the 3rd and 6th months in the trospium and solifenacin groups (p>0.05). In the tolterodine group, the rate and severity of dry mouth continued to increase after the 3rd month (p<0.05).

When the complaints of anxiety were examined, a significant increase was observed in only the tolterodine group at the 3rd month compared to before the treatment (p<0.05), while there was a statistically significant increase in anxiety at the 6th month in all 3 drug groups compared to both the baseline and the 3rd month (p<0.05).

It was determined that the complaint of vertigo was significantly increased only in the tolterodine group at the 3rd month compared to the pre-treatment (p<0.05). At the end of the 6th month, there was a significant increase in the complaints of dizziness in both the tolterodine and solifenacin groups compared to the 3rd month, while there was no significant increase in the complaints of dizziness in the trospium group at any time (p>0.05).

When the complaint of insomnia was compared, no statistically significant increase was found in any treatment group at the end of the 3rd month compared to the pre-treatment (p>0.05) At the end of the 6th month, there was a significant increase in the complaint of insomnia in all treatment groups compared to the 3rd month (p<0.05).

When the complaints of nausea and vomiting were examined, a statistically significant increase was found in the 6th month only in the solifenacin group compared to the pre-treatment (p<0.05), while no difference was observed in the complaints of nausea and vomiting in the other treatment groups (p>0.05).

No significant urticaria development was observed during the treatment period in the trospium and solifenacin groups (p>0.05). A statistically significant increase was observed in the rate of development of urticaria only in the tolterodine group after the 3rd month compared to before treatment (p<0.05).

DISCUSSION

In the study conducted by Burgio et al. (21) in Baltimore, 58% of 541 healthy women aged 42-50 years reported urinary incontinence at any time and 30.7% reported urinary incontinence at least once a month. In this study, the mean age of all patient groups was found to be 54.18 years, and almost all of them were perimenopausal and postmenopausal patients.

In another study, prevalence rate of incontinence to be 37.6% in all women aged 50 years and older. Stress was found in 26.7% of these women, urge in 9.1% and mixed incontinence in 55.3% (22). In our study, the mean age of all patient groups was found 54.18 years. Moreover, mixed and urge incontinence was consistent with the expected group. Dwyer et al. (23) found that women with detrusor instability and stress incontinence were 20% more overweight compared to their age and height. Increased body weight causes an increase in abdominal wall weight and an increase in intra-abdominal pressure and intravesicular pressure. Bump et al. (24) showed a significant improvement in incontinence with weight loss. The mean BMI of the patients in our study was 30.4 for the whole patient

group, 29.8 for the trospium chloride patient group, 31.5 for the tolterodine patient group, and 30.1 for the solifenacin patient group. There was no statistically significant difference between the groups in terms of BMI (p=0.402). The mean BMI of the study group was consistent with the expected values for incontinence.

In a study conducted by Burgio et al. (25) the parity average was found to be 2.6 for continent women, 2.5 for those with rare urinary incontinence, and 2.7 for those with regular incontinence. In this study, the mean parity of the trospium chloride patient group was 3.74, the mean parity of the tolterodine patient group was 4.74, and the mean parity of the solifenacin patient group was 4.42, which supports Burgio et al. In addition, the p value for age was 0.317 in our study, and no significant difference was found between the groups. There were six cesarean sections in total, one in the trospium chloride patient group, three in the tolterodine patient group, and two in the solifenacin patient group, and this value was not statistically significant.

Trospium chloride, tolterodine and solifenacin are M3 receptor blockers which were compared with each other in this study. Comparisons of these three molecules were made not only in terms of their efficacy but also in terms of their side effects. In general, the usability and tolerability of all three drugs in both mixed and pure urge incontinence cases were determined based on the scores in the UDI-6, IIQ-7 and anticholinergic side effect evaluation questionnaires. Thus, it was evaluated to what extent the side effects that the patients were exposed to due to the drugs prevented the improvement in their complaints and quality of life.

In 2007, Cam et al. (26) investigated the applicability of IIQ-7 and UDI-6 on Turkish people in their study. They conducted these studies on 302 patients who applied to İstanbul Zeynep Kamil Hospital between March 2004 and October 2004 had urinary incontinence at least once in the past 12 months. As a result of the studies, they concluded that IIQ-7 and UDI-6 gave consistent results on Turkish people and were usable. In this study, an improvement was found in IIQ-7 quality of life scores with all three antimuscarinic drug groups on patient groups.

In the study performed by Abrams et al. (27) in 2005, they found that solifenacin achieved a good balance in treatment and tolerability and increased patient compliance and satisfaction in the long term. Solifenacin was found to be better in terms of side effects compared to the other two drug groups, in this study. In addition, the use of a single dose per day was considered as an important advantage in terms of patient compliance with the treatment. Chapple et al. (28) determined that solifenacin provided a statistically significant improvement in all incontinence symptoms compared to tolterodine. They also concluded that the complaint of blurred vision was more with tolterodine. Similarly, it was found that solifenacin was more effective than tolterodine in terms of incontinence symptoms, and blurred vision was more common in the tolterodine patient group. In another previous study, it was mentioned that solifenacin caused decrease in incontinence complaints faster than tolterodine (29). In this study, all three antimuscarinic drug groups had a significant effect on reducing incontinence complaints, but solifenacin provided a faster recovery on incontinence symptoms at the end of the third month, although not different from the sixth month.

In terms of irritative symptoms, there was a statistically significant difference between the tolterodine patient group and the solifenacin and trospium chloride patient group at baseline, and this difference persisted at the sixth month because of the higher baseline values of irritative symptoms in the tolterodine patient group or because solifenacin and trospium chloride had a better effect on irritative symptoms. The question of whether it is effective requires further research. The fact that the tolterodine patient group had fewer complaints in terms of obstructive and voiding difficulties at the beginning, and the closure of this difference between the tolterodine patient group and the solifenacin and trospium chloride patient groups at the end of the sixth month, suggests that tolterodine has a stronger effect on obstructive and voiding difficulty.

In many studies, the effects and side effects of existing drugs were compared with placebo, while comparisons of drugs with each other were less studied (30,31). Comparative studies of trospium chloride and tolterodine were insufficient. It was observed that their efficacy was not different from each other in only one study (32). In the UDI-6 questionnaire, in which we evaluated the drug efficacy together in our study, similar efficacy was found between the two drugs at the end of the third month, not different from the sixth month.

Trospium chloride, with its quaternary amine groups and positive charge, is low lipophilic and non-receptor specific. It passes to the central nervous system to a lesser extent than tolterodine, and although the receptor is not selective, it affects the muscarinic receptors in the central nervous system much less (33). In our study, while tolterodine causes dizziness in patients in the early period, the same effect occurs with solifenacin in the later period. Trospium chloride, on the other hand, did not have an effect of increasing dizziness on patients.

In a 2003-published literature (34) review of 6800 people and 32 separate studies, it was stated that anticholinergic drugs provided statistically significant improvement compared to placebo. However, side effects such as dry mouth and increased residual urine were emphasized in all studies. In our study, we also found a significant increase in dry mouth and residual urine in all three drug groups, with varying amounts. In the study of Metello J. et al. (35) solifenacin was found to be more tolerable than trospium. Constipation and dry mouth, which are the most common side effects of anticholinergic use, were less common in solifenacin than in trospium, in this study (**Table 6**).

In a meta-analysis by Thomas M. Kessler and his team (36) in February 2011, they reviewed 69 studies with a total of 26229 patients. According to the results of the meta-analysis, they concluded that all three anticholinergic drugs used in our study cause similar side effects and that overactive bladder treatment should be started with any of them, and if the drug is found to be ineffective on the patient, dose adjustment or switching to another drug is required. While similar side effects were observed with solifenacin and trospium chloride in this study, tolterodine was found to be more risky in terms of side effects compared to these two drugs.

CONCLUSION

Tolterodine, trospium chloride and solifenacin as anticholinergic drugs meaningfully reduced the activity of bladder and increased the quality of life. Drug therapy provided an effective and efficient improvement on incontinence.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was conducted with the permission of the Noninvasive Clinical Education Planning Board of 3rd step Training and Research Hospital in Ankara. (Date: 25.11.2019, Decision No: 2009/119).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version

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